RESEARCH DEPARTMENT

Pulse sound:
interference suppression

RESEARCH REPORT No. EL-3

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THE BRITISH BROADCASTING CORPORATION
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RESEARCH DEPARTMENT

PULSE SOUND : INTERFERENCE SUPPRESSION

Research Report No. EL-3
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PULSE SOUND : INTERFERENCE SUPPRESSION

Section Title Page

SUMMARY 1

1. INTRODUCTION 1

2. RELEVANT DETAILS OF PULSE-SOUND SYSTEM 1

3. EFFECTS OF IMPULSIVE INTERFERENCE 2

3.1. Characteristics of Interference Pulse 2
3.2. Effect of Interference Pulses on a Pulse-Sound Decoder 2

4. SOME POSSIBLE METHODS OF IMPULSIVE-INTERFERENCE SUPPRESSION 3

4.1. General 3
4.2. Logical Methods of Suppression 3
    4.2.1. Complex Logical Suppressor 4
    4.2.2. Simple Logical Suppressor 5
4.3. Pulse-shape-discriminator Suppressors 5
    4.3.1. Clipping and Filtering Suppressor 5
    4.3.2. Suppression by Detection of Positive and Negative Lobes 7
    4.3.3. Suppression by Detection of Pulse Amplitude 7
4.4. Suppression of Interference Pulses Occurring After Sound Pulses 7

5. PERFORMANCE OF INTERFERENCE SUPPRESSORS 7

6. CONCLUSIONS 9

7. REFERENCES 10

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Research Report No. EL-3
UDC 621.397.238: 1967/9

PULSE SOUND : INTERFERENCE SUPPRESSION

SUMMARY

This report is concerned with the suppression of impulsive interference, such as that produced by motor-car ignition systems, in the "pulse-sound" system of transmitting the sound accompanying 625-line television signals.

The various methods of suppression which have been investigated are described and their suitability for use in professional equipment and in domestic receivers is discussed.

1. INTRODUCTION

Pulse sound refers to a system of transmitting the sound signal of a television programme by means of position-modulated pulses incorporated within the video waveform. This system has been described in detail elsewhere.[1]

While the pulse-sound system is reasonably resistant to most forms of interfering signal which may be added to a radiated television signal, (e.g. echoes and co-channel interference), it is very vulnerable to impulsive interference since the interfering pulses may be similar in character to the sound pulses. If no interference suppressor is fitted, impulsive interference degrades the quality of the sound to a far greater extent than it degrades the picture; the subjective effect is similar to that experienced with a.m. television-sound receivers not fitted with suitable suppressors. Levels of impulsive interference which would be quite acceptable using present-day a.m. receivers fitted with "rate-of-rise" limiters can be quite unacceptable with a pulse-sound receiver not incorporating an impulsive-interference suppressor. The ability to suppress impulsive interference is therefore an essential requirement of a pulse-sound decoding circuit.

2. RELEVANT DETAILS OF PULSE-SOUND SYSTEM

The details of the pulse-sound system which are relevant to this study are as follows:

(a) Position-modulated pulses carrying the sound-signal information are inserted during the line-blanking intervals of the 625-line video signal as shown in Fig. 1 and have the form described in Reference 1.

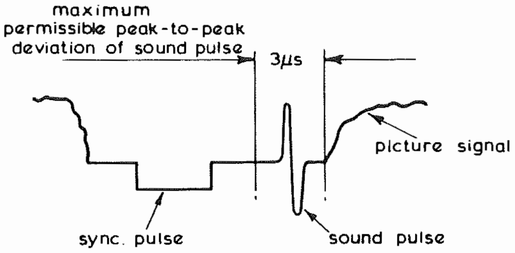

Fig. 1 - Video signal incorporating sound pulse

(b) The time of occurrence of a sound pulse with respect to its rest position indicates the magnitude of a sample of the original audio signal. Pulses occurring at the maximum permissible deviations (± 1·5 μs) shown in Fig. 1 correspond to the maximum positive and negative excursions of the sound signal.

(c) The video signal containing the sound pulse negatively modulates the vision carrier. Fig. 2 shows the waveform of a modulated carrier corresponding to the video waveform shown in Fig. 1.

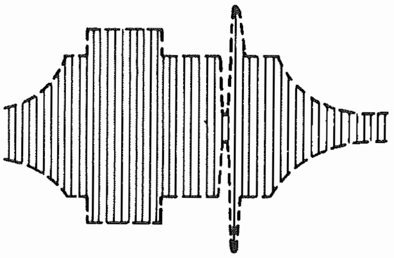

Fig. 2 - Envelope of carrier modulated by signal shown in Fig. 1

3. EFFECTS OF IMPULSIVE INTERFERENCE

3.1. Characteristics of Interference Pulse

The photographs of Figs. 3, 4 and 5 show video waveforms of received impulsive interference and sound pulses obtained from the detector of a receiver whose i.f. response limits the video bandwidth to 4·5 MHz; the video wavefoms in these pictures were displayed with white upwards and syncs downwards. The impulsive interference was obtained by adding the output from a narrow-pulse generator to the v.h.f. input signal to the receiver and each photograph shows, superimposed, the effects of a large number of interference pulses having equal amplitudes and occurring regularly at line-scan frequency. The differences in the shapes of individual interference pulses giving rise to a hazy appearance in the photographs are due to the differences in relative phase between the v.h.f. carrier signal and each interfering pulse. Interference pulses of the same magnitude as those shown in Fig. 3 are shown on an expanded time scale in Fig. 4 in order to indicate the shapes of the pulses in more detail. Fig. 5 shows the waveform produced by interference pulses having high amplitude and illustrates the important point that, when negative modulation is used, all the video pulses produced by intense impulsive interference tend to be similar in shape and have a main lobe excursing in the sync direction.

3.2. Effect of Interference Pulses on a Pulse-Sound Decoder

In order that the effect of impulsive interference on the pulse-sound system may be understood, the basic details of a pulse-sound decoding circuit will be described. The sound pulses are first separated from the video information by means of a gating circuit which only passes information during intervals which embrace and slightly exceed the maximum deviation range of the sound pulses. This gating interval is made as short as is practicable in order to exclude as many interference pulses as possible.

The exact time of occurrence of each gated sound pulse is identified by the moment when the pulse voltage crosses the threshold level of a level-detecting or slicing circuit. This may either be a trigger circuit such as a multi-vibrator or a circuit characterised by a very sharp transition from "off" to "on" (e.g. a grounded-emitter transistor having a large collector load). A suitable level at which such a circuit should operate is indicated in Fig. 6(*a*).

Any interference pulse which occurs within the gating interval and has sufficient magnitude to operate the level detector of the sound-pulse decoder

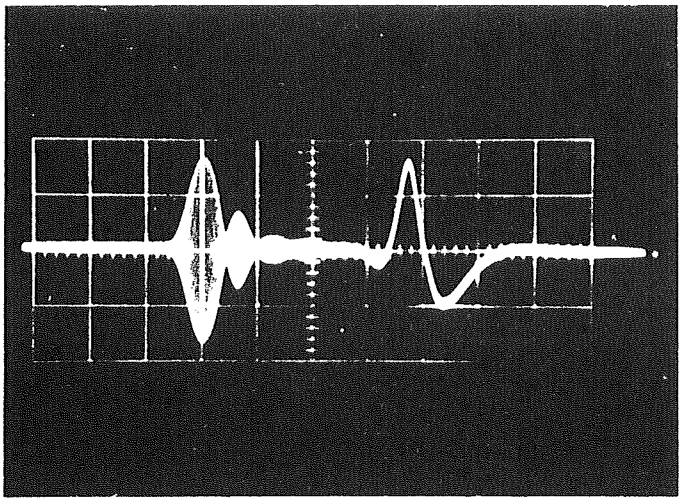

Fig. 3 - Medium amplitude interference pulses and sound pulse - time base set to 0·5 μs/cm.

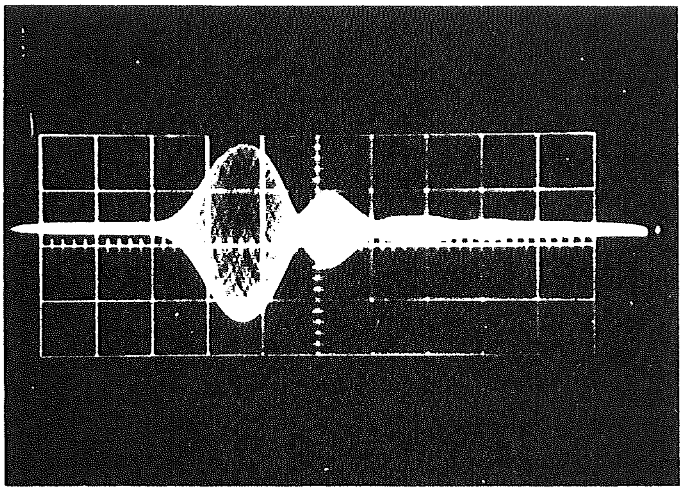

Fig. 4 - Medium amplitude interference pulses - time base set to 0·2 μs/cm.

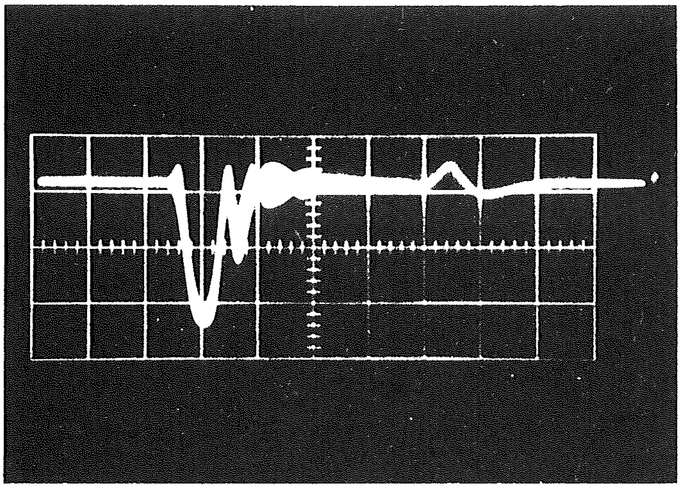

Fig. 5 - High amplitude interference pulses and sound pulse - time base set to 0·5 μs/cm.

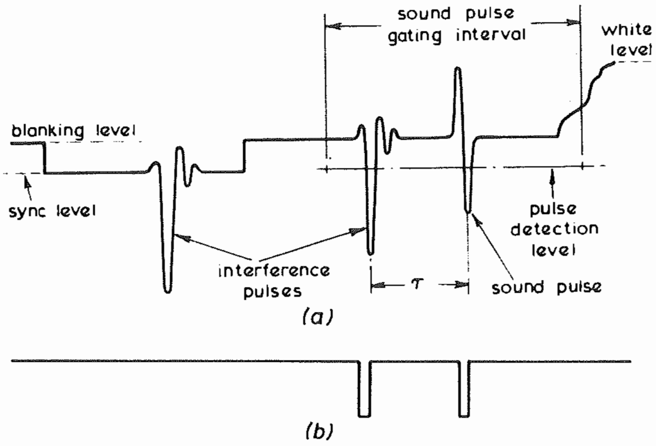

Fig. 6 - Effect of unsuppressed interference pulses on output of sound pulse detector

(*a*) Video signal including interference pulses

(*b*) Output of sound pulse detector

will be mistaken for a sound pulse. For example, the output of the level detector resulting from the interference and sound pulses shown in Fig. 6(*a*) would be as shown in Fig. 6(*b*).

For an original audio signal of the form shown in Fig. 7(*a*), the train of pulses obtained from the level detector is of the form shown in Fig. 7(*b*); the full lines indicate detected sound pulses and an interference pulse while the broken lines indicate the times at which the sound pulses would occur if they had not been deviated by the audio signal.

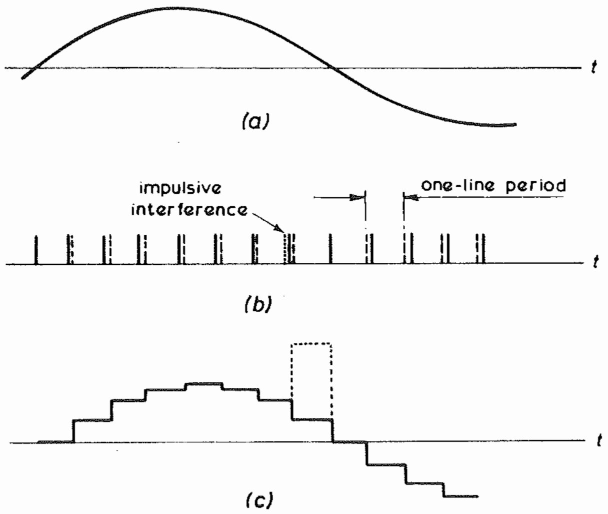

Fig. 7 - Comparison of original and decoded audio signals

(*a*) Original audio signal (*b*) Separated sound pulses

(*c*) Decoded audio signal

– – – – – – positions of undeviated sound pulses

———— deviated sound pulses

················ interference pulse

The separated pulses are fed to a circuit which produces a voltage proportional to the amount by which each pulse has been deviated. If the voltage resulting from any given pulse is held constant until the following pulse is received, the output voltage obtained from a decoder fed with the pulse waveform shown in Fig. 7(*b*) is of the form shown in Fig. 7(*c*). In this figure, the full line represents the wanted audio signal, while the dotted line indicates the spurious signal resulting from the interference pulse shown in Fig. 7(*b*). The magnitude of the spurious signal resulting from an interference pulse is proportional to the difference in the times at which the interference occurs and the epoch at which an undeviated sound pulse would occur.

The final decoded audio signal is obtained by passing the signal shown in Fig. 7(*c*) through a low-pass filter with a cut-off frequency of about one half the repetition frequency of the undeviated sound pulse.

For instrumental reasons, the gating interval may be somewhat longer than is theoretically necessary and the magnitude of the spurious sound signal caused by an interference pulse may then exceed the magnitude of the wanted sound signal.

4. SOME POSSIBLE METHODS OF IMPULSIVE-INTERFERENCE SUPPRESSION

4.1. General

The methods of impulsive interference suppression which have been investigated can be divided into the two following groups:

(a) "Logical" methods, and

(b) "Pulse-shape-discriminator" methods.

Interference suppressing circuits based on these principles are discussed below.

4.2. Logical Methods of Suppression

The principle of this method of suppression is that if the sound-pulse separator is operated more than once during one gating interval, a logical circuit operates and suppresses all the pulses occurring during that interval; thus the recovered sound signals are imperfect when interference pulses are present since a wanted sound pulse is suppressed together with any interference pulse, or pulses, which occur during the same gating interval. However, with most types of sound-pulse decoder and with normal sound signals, the imperfections caused when occasional sound pulses are suppressed are

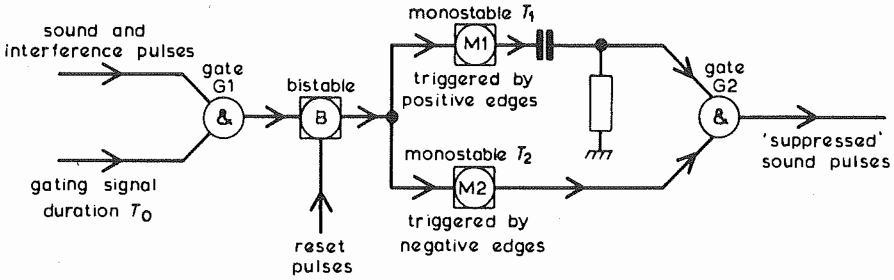

Fig. 8 - Block diagram of complex logical suppressor

far less annoying than the spurious sounds obtained from interfering pulses; this is true for ramp decoders incorporating "sample-and-hold" circuits but is not true for the "integrating" type of decoder.[2] Two types of logical suppressor were investigated and these are described below.

4.2.1. Complex Logical Suppressor

With this type of interference suppressor, the separated pulses are delayed by an interval which is slightly longer than the duration of the sound-pulse gating interval; these delayed pulses are then fed to the sound-pulse decoding circuit. If two or more pulses occur during one sound-pulse gating interval, a circuit is operated which rejects all the delayed pulses derived during that gating interval.[3]

A block diagram of one form of this type of suppressor is shown in Fig. 8 and the waveforms of signals at various points in this block diagram are shown in Fig. 9.

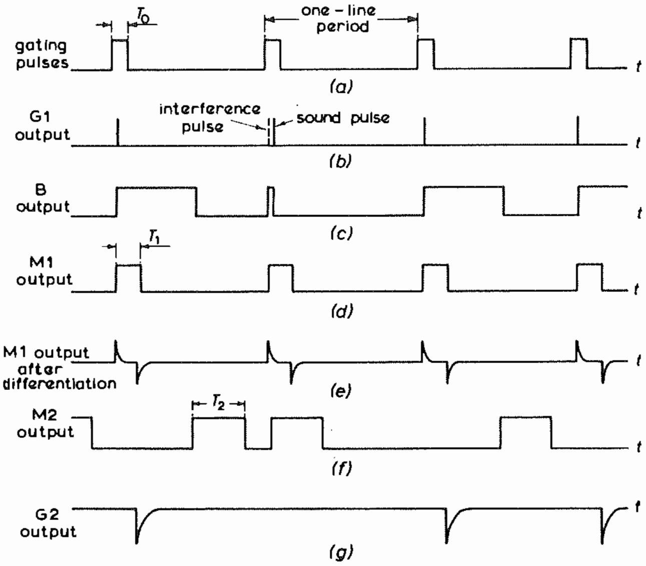

Fig. 9 - Waveforms in complex "logical" suppressor

(a) Sound pulse gating signal
(b) Sound and interference pulses
(c) Output of bistable
(d) Output of monostable M1
(e) Output of differentiating network
(f) Output of monostable M2
(g) "Suppressed" sound pulses

Gate G1 only passes sound and interference pulses during the gating intervals of duration T_0 shown in Fig. 9(*a*) and the output pulses from G1, shown in Fig. 9(*b*), trigger a bistable circuit B. This bistable is reset to a given state in the middle of each line period, the resulting output signal being shown in Fig. 9(*c*). The output of B is coupled to the two monostable circuits M1 and M2 with unstable periods of T_1 and T_2 which are triggered by positive and negative-going edges respectively. M1 is therefore triggered by the first pulse occurring within each gating interval, while M2 is triggered either by the second pulse, if it exists, or by the resetting of the bistable (see Figs. 9(*d*) and 9(*f*)). T_1 is arranged to be slightly greater than T_0, and T_2 is made slightly greater than $(T_0 + T_1)$. Finally, the output signal from M1 is differentiated (see Fig. 9(*e*)) and is then fed to the gate G2 which only passes pulses that are negative going and which occur during the stable state of M2. If two pulses occur during one sound-pulse gating-interval, then the second of these pulses operates M2 with the result that G2 is closed to all signals occurring during that interval. The signal at the output of G2 therefore consists of a train of position-modulated sound pulses from which those which were accompanied by interference pulses have been removed (see Fig. 9(*g*)). The effect of this type of suppressor on the decoded sound signal before it is finally passed through a low-pass filter is illustrated in Fig. 10. As previously explained, unsuppressed interference pulses cause spurious audio signals of the form indicated by the broken lines in Fig. 10(*a*). When these pulses are suppressed, the remaining spurious signals are as indicated by the broken lines in Fig. 10(*b*). This figure shows that, when the suppressor is operated, the magnitude of the audio signal for the following line period is held constant at the value existing during the previous line period.

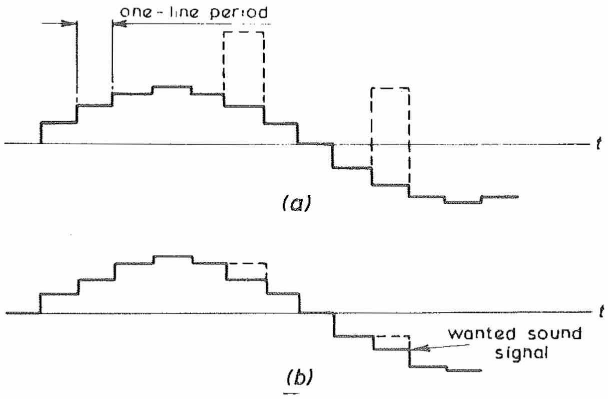

Fig. 10 - Effect on audio signal of complex logical suppressor

(*a*) No suppression (*b*) Suppressor in operation

———— Wanted audio signal
– – – – – Spurious signals produced by impulsive interference.

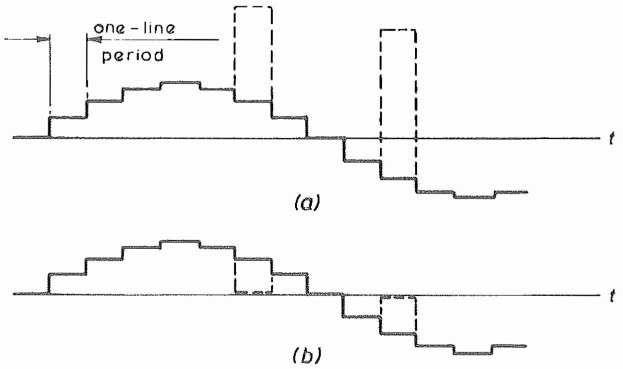

Fig. 11 - Effect on audio signal of simple logical suppressor

(*a*) No suppression (*b*) Suppressor in operation

———— Wanted audio signal
– – – – – Spurious signals produced by impulsive interference.

The method of suppression described above is rather complex but, with normal sound signals, it is very effective and is also very reliable in its operation. The main disadvantages of this type of suppressor are:

(a) As already mentioned, sound pulses as well as interference pulses are suppressed and this happens irrespective of whether an interference pulse occurs before or after a sound pulse within a given gating interval. This disadvantage of the logical suppressor is not normally very noticeable but is marked if the sound signal contains strong components whose frequencies approach one half the line-scan frequency.

(b) An interference pulse which occurs shortly before or after a sound pulse is not suppressed. This results from instrumental difficulties involved in triggering M2. This is not a very serious disadvantage, however, as the magnitude of the resulting spurious signal is not very large.

(c) The cost and complexity of this form of suppressor render it unsuitable for use in domestic equipment.

4.2.2. Simple Logical Suppressor

Since the type of circuit described above is too complex for use in a domestic receiver, a simpler circuit using a similar principle of operation was devised.

The basic method of operation of this simple logical suppressor is that each pulse occurring in a sound-pulse gating interval causes a known quantity of charge to be added to a capacitor. The charge on this capacitor is allowed to leak away in the interval between successive sound pulses. When an interference pulse as well as a sound pulse occurs during a gating interval, the peak voltage on the capacitor rises to about twice its normal value. When the presence of an interference pulse is indicated in this way, the decoded sound signal is clamped to its mean level during the following line period. The effect of this type of interference suppressor is illustrated in Fig. 11; it is assumed in Fig. 11(*b*) that the horizontal axis represents the mean level of the audio signal. It can be seen from Figs. 10 and 11 that, in the absence of sound-pulse modulation, both types of logical suppressor have the desirable feature that no spurious signals remain. In the presence of modulation, operation of the complex circuit causes, in general, less disturbance of the decoded audio signal than when the simple circuit is operated.

The simple logical suppressor circuit can produce a satisfactory reduction in the spurious sounds caused by interference pulses, but was not developed further when it was found that a pulse-shape-discriminator could be made which used still fewer components and which was more effective.

4.3. Pulse-shape-discriminator Suppressors

Interference suppressors of this type rely on an ability to distinguish between certain characteristics of interference pulses and sound pulses. Three different circuits of this type have been investigated, the details of which are given below.

4.3.1. Clipping and Filtering Suppressor

This method of suppression which has been designed for use in a domestic receiver, will be explained by reference to the circuit shown in

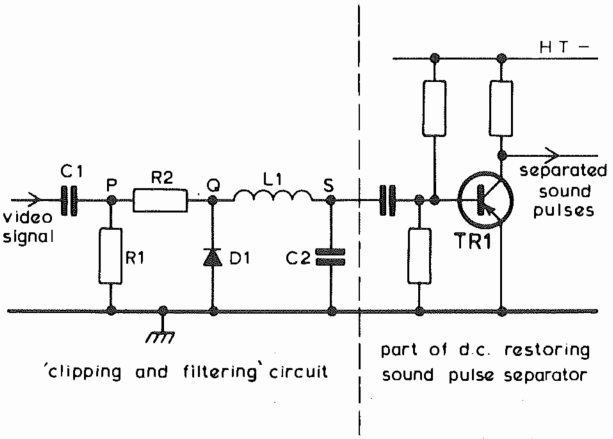
H T −
C1
P
R2
Q
L1
S
video signal
R1
D1
C2
separated sound pulses
TR1
'clipping and filtering' circuit
part of d.c. restoring sound pulse separator

Fig. 12 - Circuit of "clipping and filtering" suppressor

Fig. 12. The video signal supplied to this circuit has a peak-to-peak magnitude of a few volts and is obtained from a relatively low-impedance source; the polarity of the signal is such that synchronising pulses are negative-going. The coupling network C1.R1 has a time constant approximately equal to the duration of the sound pulse and rejects low-frequency components of the video signal without greatly affecting the shape of the sound pulse. The waveforms of a sound pulse and a typical interference pulse at the point P are shown in Fig. 13(*a*).

Referring again to Fig. 12, the resonant frequency of the tuned circuit L1.C2 is arranged to be equal to that at which the sound pulse has maximum energy. Since the input impedance of L1.C2 is low at this frequency, the amplitude of the sound pulse is relatively small at point Q and the sound pulse is therefore only slightly clipped by the diode D1. This argument does not apply to interference pulses and the negative-going lobes of such pulses are heavily clipped by D1. The full line in Fig. 13(*b*) indicates the waveform of sound and interference pulses at the point Q when D1 is connected; the broken line in this figure indicates the shape of this waveform when D1 is disconnected.

The circuit L1.C2 has a second advantageous effect in that its transfer characteristic has a peak at the frequency at which the sound pulse has maximum energy. As a result, the negative-going lobe of the sound pulse at the junction of L1 and C2 (i.e. at point S), is greater under most practical conditions than the negative lobes of the clipped interference pulses (see Fig. 13(*c*)). It is thus possible to separate sound pulses from interference pulses by feeding the signal obtained at the point S to a level detector which operates when the signal is more negative than a certain value such as that shown by the broken line in Fig. 13(*c*); this circuit is normally followed by a sound-pulse gating circuit of the form referred to in Section 3.2.

A suitable level detector is included in Fig. 12. In this circuit, the signal at the base of the transistor TR1 is d.c. restored to the negative tips of the sound pulses. With suitable bias, the transistor remains cut-off during interference pulses and only conducts during the negative tips of the sound pulses. One of the advantages of this type of level detector is that it continues to operate satisfactorily when the magnitude of the video signal is varied over a wide range; this is an essential requirement of a sound-pulse decoder which is to be used in a domestic receiver.

The interference suppressing circuit described above can be very effective when correctly adjusted.

The main disadvantage of this circuit is that if the receiver causes distortion of the sound pulse, then the difference in the peak negative-going excursions of the interference and sound pulses at the base of TR1 can become insufficient for satisfactory discrimination between the two types of pulses. Such distortion can be caused by mistuning or misalignment of the receiver.

This type of interference suppressor also suffers from the defect that interference pulses occurring shortly before the sound pulse tend to prevent the latter pulse from triggering the level detector. The reason for this defect is that C1 becomes positively charged while D1 is conducting during an interference pulse. As a result, a positive bias is superimposed on the signal which may be sufficient to prevent a following sound pulse from reaching the triggering level of the level detector. Nevertheless, the circuit is an economical and practical method of reducing the effects of impulsive interference.

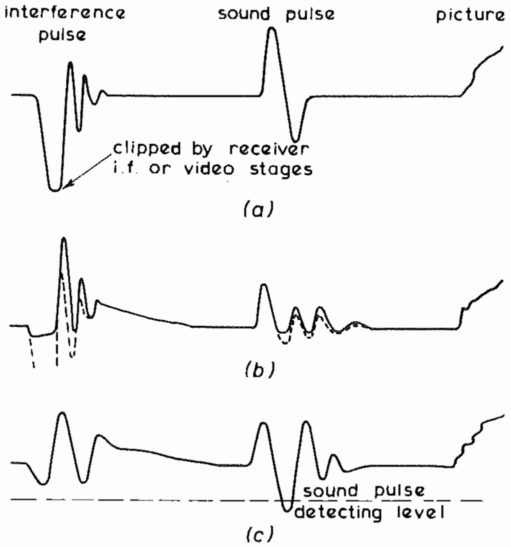
interference pulse
sound pulse
picture
clipped by receiver i.f. or video stages
(a)
(b)
sound pulse detecting level
(c)

Fig. 13 - Waveforms of interference and sound pulses in "clipping and filtering" suppressor
(*a*) Signal at P (*b*) Signal at Q
(*c*) Signal at S

4.3.2. Suppression by Detection of Positive and Negative Lobes

This method of suppression takes advantage of the fact that a sound pulse contains two lobes of opposite polarity which are separated by a known time interval. A block diagram of a suppressing circuit of this type is shown in Fig. 14(*a*). As in other forms of suppressor, the sound pulses are first separated from the video signal by means of a gate G1 which only conducts during the intervals in which sound pulses occur. The train of sound pulses is then fed to two level detectors which operate when the signal magnitude exceeds certain positive and negative values such as those shown in Fig. 14(*b*). The output of the positive-pulse detector is then delayed so that it can open gate G2 during the interval when a signal should appear at the output of the negative-pulse detector. The vast majority of interference pulses do not fulfil the conditions that must be satisfied in order to operate the circuit and they are therefore prevented from appearing in the final train of sound pulses.

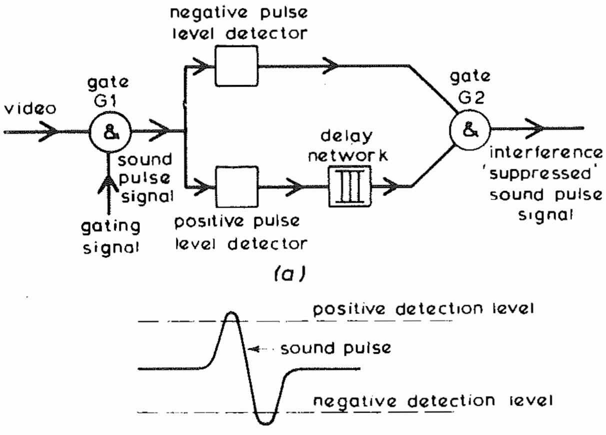

Fig. 14 - "Positive and negative lobe" sound pulse detector
(*a*) Block diagram
(*b*) Sound pulse detection levels

It was found that this method of suppression can be very effective but it requires that the trailing edge of the gating signal to G1 be precisely timed so that no video information from the leading edge of each active line period is allowed to pass through G1. If such video information is allowed to pass through G1, and is of a similar or greater amplitude than that of the positive lobe of the sound-pulse, it is possible for this video information to bias-off the positive-pulse detector with the result that the positive lobe of the sound pulse no longer operates this detector; when this happens all the sound pulses are suppressed.

4.3.3. Suppression by Detection of Pulse Amplitude

In this method of suppression, any pulse which has a greater magnitude than the sound pulse is prevented from reaching the sound pulse detector. In order to discriminate between interference and sound pulses in this way, it is necessary to derive a voltage equal to the magnitude of the sound pulse; this is then used to bias a level detector which is operated by any pulse whose magnitude exceeds the bias. The output of this level detector is used to suppress any pulse which caused it to operate.

The main disadvantage of this method of suppression is that it fails to suppress interference pulses which have magnitudes approximately equal to that of the sound pulses and this disadvantage can be particularly serious if the peak magnitude of the interference pulses is limited by any video stage previous to the suppression circuit.

4.4. Suppression of Interference Pulses Occurring After Sound Pulses

Interference pulses which occur shortly after a sound pulse can be suppressed relatively easily by arranging that the sound-pulse decoder becomes insensitive for a short period after it has been triggered by a sound (or interference) pulse.

Such an arrangement is particularly desirable in a domestic receiver using a suppressor of the form described in Section 4.3.1. Sound-pulse gating circuits may admit the first microsecond or two of video signal at the beginning of each active line period and interference pulses, when added to video, can more easily break through such a suppressor.

This expedient of making the decoder insensitive for a short period after it has been triggered is useful with all types of pulse-shape-discriminator suppressors but has no value when a logical suppressor is used.

5. PERFORMANCE OF INTERFERENCE SUPPRESSORS

In order to test the performance of a typical suppressor circuit, pulses from an impulse generator were added to a v.h.f. signal modulated by a 625-line pulse-sound video signal. This signal was fed to a 625-line domestic type receiver which had been adapted to decode pulse-sound signals. The interfering pulses were all approximately equal in amplitude and occurred at a rate of 50 per second; this rate was selected as it is approximately equal to the rate at which a normal 4-cylinder motor car would produce impulsive interference when travelling at 30 m.p.h. in top gear.

The subjective effects of impulsive interference of this type on both sound and picture quality was graded by three observers according to the subjective scale given in Table 1.

TABLE 1

Scale of Subjective Effect of Interference

Subjective effect of interference	Score
Imperceptible	1
Just perceptible	2
Definitely perceptible but not disturbing	3
Somewhat objectionable	4
Definitely objectionable	5
Unusable	6

The effect on sound quality was examined both with and without interference suppression, carried out by means of the clipping and filtering suppressor described in Section 4.3.1.

The tests were carried out with input signals to the receiver having peak-to-peak magnitudes of 300 μV and 3 mV. (300 μV corresponds to the signal strength to be expected at the edge of a receiving area.) Very similar results were obtained with both signal strengths.

The results of the tests are shown in Fig. 15. 0 dB on the scale indicating "Interference Level" corresponds to impulsive interference giving pulses on the detected video signal which are equal in magnitude to the sound pulses, as shown in Fig. 3.

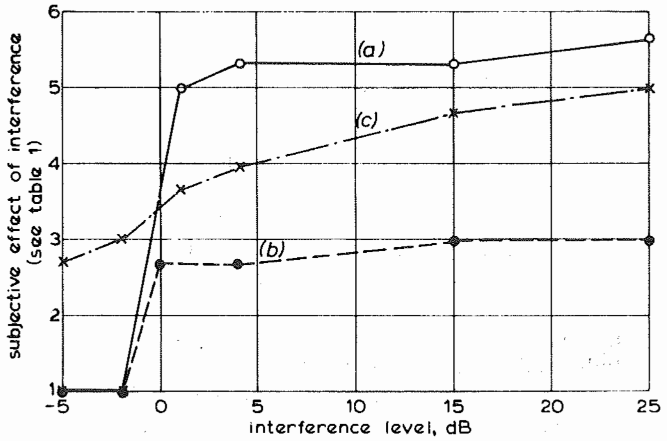

Fig. 15 - Subjective effect of impulsive interference on sound and picture quality

(*a*) Sound quality without suppression
(*b*) Sound quality with suppression
(*c*) Picture quality

The audio signal used in the tests consisted of normal speech. It was found that similar results were obtained during quiet passages of music while with loud music the subjective impairment of the sound quality was slightly less.

Curve (*a*), showing the effect of unsuppressed impulsive interference, indicates that, as expected, spurious audio signals are obtained only when the peak magnitude of the impulsive interference is equal to or greater than that of the sound pulses; this curve also shows that the disturbance of the audio signal is practically independent of the magnitude of the interference when it is greater than that of the sound pulses.

Comparison of the curves obtained with and without interference suppression shows that the suppressing circuit produced a marked reduction in the disturbance of the audio signal resulting from impulsive interference.

It can also be seen that, when interference suppression is used, the impulsive interference always has less subjective effect on the sound quality than on the picture quality; whereas, with no interference suppression, the sound quality is disturbed more than the picture quality for relative interference levels greater than 0 dB.

The other types of interference suppressor which have been described in this report were all capable of giving a similar performance to that indicated in Fig. 15, but have the practical disadvantages already discussed.

As a further indication of the performance of the suppressor described in Section 4.3.1, waveforms of decoded audio signals obtained in the presence of impulsive interference are shown in Figs. 16(*a*) and (*b*). The frequency of the audio signal used was 30 Hz while the repetition rate of the impulsive interference was about 1 kHz. The repetition rate of the pulses appearing on the audio signal shown in Fig. 16(*a*) is far lower than 1 kHz because:

(*a*) only about 8% of the interference pulses present in the composite video signal occurred within the sound-pulse gating interval (see Fig. 6), and

(*b*) the sound-pulse decoder was insensitive to interference pulses which although they occurred within the sound-pulse gating-interval, followed a sound pulse (see Section 4.4.); the leading edges of the pulses in Fig. 16(*a*) are all upward-going.

It can be seen from Fig. 16(*a*) that, when no interference suppression is used, the disturbances of the audio signal caused by interference pulses

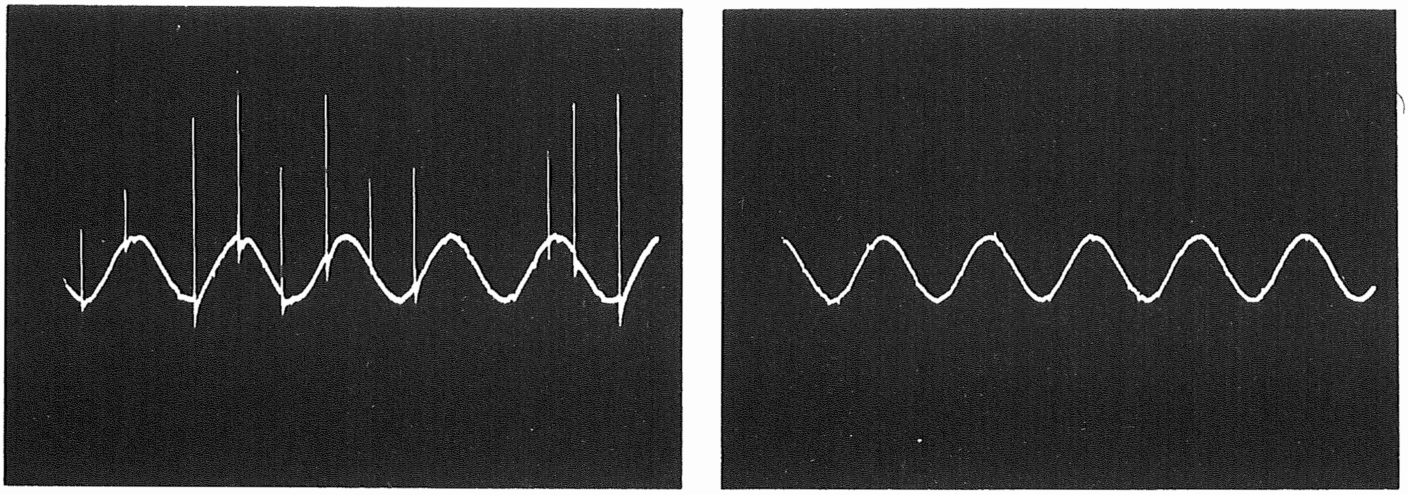
(a) (b)

Fig. 16 - Decoded sound signal obtained in presence of impulsive interference - time base length = 20 ms
(*a*) No suppression (*b*) With suppression

can have peak magnitudes several times that of the wanted signal. These disturbances cause very loud "clicks" on the sound and, when occurring at the repetition rate shown, they cause normal speech to become almost unintelligible.

The small disturbances of the audio signal shown in Fig. 16(*b*) were caused by sound pulses either being mistimed or failing to reach the sound-pulse detection level (see Fig. 6) as a result of interference pulses occurring immediately before sound pulses. The effect on the sound of small disturbances such as those shown in Fig. 16(*b*) is normally only just audible.

6. CONCLUSIONS

If no impulsive interference suppressor is fitted in a "pulse-sound" receiver, the resulting impairment of the sound obtained from the receiver is most objectionable for interference levels well within the range expected in practice. It is therefore essential that domestic receivers for pulse-sound operation should have satisfactory interference suppressors.

The investigations described in this report show that it is possible to suppress spurious sounds caused by impulsive interference to a level at which they are not unduly disturbing to the listener.

Logical interference suppressors inhibit sound pulses at the same time as they suppress interference pulses and this happens regardless of whether the interference pulse precedes or follows the sound pulse in the sound-pulse gating interval. A somewhat similar effect is liable to occur with the clipping-and-filtering suppressor but it is restricted to interference pulses preceding the sound pulse. These disadvantages are relatively unimportant, however, as the spurious signals caused by missing sound pulses are not normally very noticeable, provided that the sound-pulse decoder is not of the integrating type.

The principal advantage of the complex logical suppressor is that it is more reliable than the other circuits which have been investigated; it does not rely on the accurate adjustment of level-detecting circuits and also it cannot be "misled" by interference pulses which have characteristics similar to those of sound pulses. Taking both effectiveness and reliability into account, the complex logical suppressor would appear to be the best form of suppressor for use in professional decoders.

However, the complex logical suppressor is not suitable for use in a domestic receiver as it requires too many components. The only suppressor investigated so far which has been found to be practicable for use in a domestic receiver is the clipping-and-filtering type; this circuit uses fewer components than the other circuits investigated, and is capable of giving a very satisfactory reduction in spurious sounds caused by impulsive interference. The principal weakness of the circuit is that, after clipping and filtering, the difference in level between interference and sound pulses is not as great as might be desired and the suppressing action may become less effective if the sound pulse supplied to the circuit is distorted; such distortion may be caused by mistuning of the receiver used to demodulate the video signal containing the sound pulse.

7. REFERENCES

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